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10. The following table gives the number of cases of smallpox reported in each State during the year 1802.

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As a result of the above, the following recommendations are made:

19. The following table gives the results of the experiments.

19. The following table gives the number of cases of smallpox reported in each State during the year 1802.

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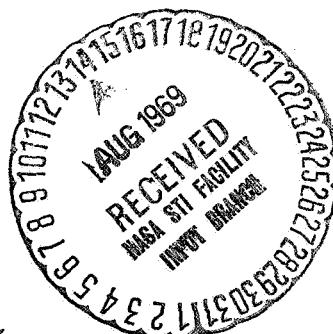
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REFERENCES

1. *Thymelicus sylvestris* (Linnaeus) *Thymelicus sylvestris*
2. *Thymelicus sylvestris* (Linnaeus) *Thymelicus sylvestris*

2. The neighborhood



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1.6 Purpose

The purpose of the program is to design and develop a high reliability, fail safe, single pole, double throw, make before break, coaxial switching device. This device is intended for operation aboard space and launch vehicles subject to extreme environmental conditions and must maintain design criteria while transmitting a radio frequency signal through 100 watt power levels from D.C. through 3,000 megahertz.

2.0 Requirements

These coaxial switches shall meet the following electrical, mechanical and environmental specifications:

2.1 Electrical

- ✓ 2.1.1 Operating Frequency: 20GHz to 3000MHz
- ✓ 2.1.2 Impedance: 50 ohms nominal
- ✓ 2.1.3 Isolation: 50dB minimum
- ✓ 2.1.4 Insertion Loss: 0.5 dB maximum
- ✓ 2.1.5 Control Voltage: 28 Volts DC
- ✓ 2.1.6 Control Power: 14 Watts maximum
- ✓ 2.1.7 VSWR: 1.5:1 maximum
- ✓ 2.1.8 Power Rating: 100 Watts CW
- ✓ 2.1.9 Switching Time: 10 milliseconds maximum
- ✓ 2.1.10 Contacts: make before break

2.2 Mechanical

- ✓ 2.2.1 Type Switch: IP22 Dust Seal
- ✓ 2.2.2 Weight: one pound maximum
- ✓ 2.2.3 Components: Type "H" R.F. Connectors

2.3 Environmental

- ✓ 2.3.1 Altitude: The switch should be capable of operation up to 100,000 feet in elevation with 1.3 watts of input power which no breakdown indication or degradation.
- ✓ 2.3.2 Temperatures: Operation at temperatures from -40°C to +85°C continuous.
- ✓ 2.3.3 Vibration: The switch should withstand 10G resonance vibration levels with no indication of damage during the power operating range of the switch permanent and non-microsecond.

2.3.3.1

- (a) Sine Wave: At 10 G's and 1 second duration with 10% amplitude perpendicular planes, 270° of the frequency should be swept logarithmically from 3 cps to 1000 cps and then from 1000 cps to 3 cps at the rate of one octave per second. The average of the sum of three mutually perpendicular planes.

2.3.3.2

(b) Random Noise: 20 G's for 6 minutes in each of three mutually perpendicular planes. 20 G's from 10 to 2000 cps for 6 minutes in each of three mutually perpendicular planes.

2.3.3.3

(c) Acoustical Noise: The switch shall withstand an average all R&B sound pressure level of 100 db, radiated exposure to .0002 dynes per centimeter squared, for a period of 2 minutes.

3.0 Procedure

3.1 General Design Concepts:

In designing a broadband switch with the ultimate in reliability, minimum weight and bulk, a new approach was required.

Historically, the basic modes employed to break a radio frequency signal through a switching device have been mechanical switching of a blade in a cavity and solid state switching where no moving parts are required.

Most coaxial switching devices were constructed using a sliding blade in a rectangular cavity. This blade was moved or distance from one end to the other by mechanical linkages actuated by an electromagnet. In low frequencies, this type of device is excellent, but as the operating frequencies of the switch increase, the centrality of the blade in the cavity becomes critical. This is most difficult to achieve because the blade must be slightly off center to obtain a wiping action on the contact surfaces. Without a wiping motion, the contact points will not clean themselves.

"Solid State" switching, may suffice at this point and would reduce extreme shock and vibration. However, in broadband applications high insertion losses and poor crosstalk must be avoided.

In the past years, Automatic Intel Products has engaged heavily in stripline work, and we have found that correctly designed and manufactured, safe defactory operation can be obtained over very broad bands of frequencies. In addition to this, the stripline technique provides unequalled rugged reliability, minimal maintenance, light weight and long life. With these advantages, the stripline principle was chosen to be our primary design goal.

In a stripline type of transmission, electromagnetic energy is transmitted through an etched flat center conductor生涯 a solid dielectric medium between ground planes parallel to the center conductor. In contrast, the stripline technique may be considered the ultimate design in the utilization of a conventional coaxial line. The inner conductor goes from a coax configuration (such as in RG 11/U type of cable) to a flat strip of very thin metal coaxial (ranging from .001 inches to .003 inches thick). The center conductor is broken into two semi-infinite ground planes. The alternate magnetic field is centrally located between the flat outer conductors (ground planes) and the primary field decay is very rapid.

The flat design of stripline coupling permits field-free directly in the dielectric medium by special photo-etching techniques; thus providing a simple, fast and inexpensive method of stripline fabrication.

To design and develop a high frequency, high reliability control switch utilizing the stripline principle, a careful systematic schedule had to be formulated. We divided the program into stages, the first being design and layout of the entire switch. We decided that a breadboard model could be built early so that all the major "debugging" could be easily handled, so the breadboard was the second stage of the schedule.

3.1 (continued)

The breadboard was subdivided into sections, the first being the R.P. section, the second the motor (electromagnet) and the third, the combination of the first two sections into one working model. The third major stage of the schedule was the building of two prototype switches and the incorporation of all of the modifications and experience gathered in the setting of the breadboard units. The completion of these prototype switches would fine-tune the design and the last stage of the program, the building, testing and delivery of the two production units could then be accomplished.

3.2 Design and Layout

A simplified description of the design goals is as follows: a 30 ohm stepped wave stripline section would be mounted in an aluminum housing. A segment of the upper half of the stripline would be converted to an electrodynamic which structure would pivot this stripline section from one mode of transmission to the other.

3.2.1. Material

The first major step was to choose a material for the stripline board. This material would have to have a low dielectric constant along with low losses. It must also have suitable dimensional stability and good bonding characteristics. After careful consideration of materials available in the market, a silicon glass substrate manufactured by Mikroel Electronics, Inc., Holmdel, New Jersey was chosen. This material has a dielectric constant of 3.9 and a loss of 0.001. It has a dielectric constant of 2.05; loss factor of .0001; insulation temperature of 250 degrees Centigrade and a bonding strength of 1000 psi. The copper clad chosen was 2 oz/in² (0.020 inches thickness). The material having electrical properties chosen because of the high dielectric constant and low dielectric constant and the high temperature resistance of silicon.

The contact fingers are a precision alloy made of gold, palladium, platinum, palladium, copper and a very small amount of silver. The gold palladium alloy provides exceptional resistance to bromide and ammonia and allows the alloy to unaffected by most industrial atmospheres. This is called the "Kynaray" compound by the J.W. May Co., Stamford, Conn. Under the trade name of "Kynaray" it was decided that the best type of insulation for this application was the double coated (age hardened) type. The following is a list of the composition and electrical properties of this material:

Resistivity: 100 ohms-cm² nominal

Conductivity: 5.4% IACS nominal

Piston Temperature: 1935 degrees Fahrenheit nominal

Coef. of Linear Expansion: 7.3 x 10⁻⁶/inch x inch x 10⁻³ (at 20 degree Fahrenheit)

Thermal emf vs. Platinum: ".8 microvolts/microvolt/in. (2-100 degree Centigrade)

Tensile Strength: 90,000 psi at 10⁶ cycles

Modulus of Elasticity: 17 x 10⁶ psi nominal

Due to the high reliability of this material, it was decided that two sets of fingers would be used in parallel to increase the signal. Each set of three fingers would be deposited approximately .015 meters and would require approximately 25 grams of pressure in the contacting interface. The fingers are hard gold plated to insure extra long life.

The R.P. connectors used on this switch are type "T" for MIL-C-1662A. They are mounted to the switch housing by means of a flange.

The flanges are braze with silver solder to the bodies of the connectors. Both of these parts are made of brass per G-4-68 and are silver plated and rhodium plated after brazeing. The silver plating has high electrical conductivity and the Rhodium to prevent tarnishing and protection against rust.

The center conductor of these connectors is thermetically coated through a compression type of glass header manufactured by Electrochemical Refractories, Murray Hill, New Jersey. The glass used in this header is Corning type 10, the composition of this header are made of E.I. 67. This header is designed so that the ratio of 10^{-6} cc/sec. helium and has successfully operated in either conductive gas thickness from -143 degrees to +143 degrees Fahrenheit. Each coil wire is run over a pin of this glass header in a helix like fashion around the center pin of this glass header in a very thin copper braid envelope. The resistance of this contact is made to QQ-S-530 and is heat treated at 100 degrees Fahrenheit for 3 hours to bring its strength to 140,000 psi. Prior to heat treatment the flanges of this contact are cut to pre-determined diameter for proper clearance with the mating pins and then heat treated. After heat treatment they are again inspected with various diameter pins for proper sleeve clearance. These contacts are silver plated for high electrical conductivity.

To reduce weight, the main body, cavity cover and top cover plates are made from Aluminum 6061-T6. This grade of aluminum has a high degree of cast and has excellent machining properties. These parts are formed through a special process whereby we first pierce with an electro-discharge and then cast the aluminum silver. The reason for this is that silver is very difficult to place directly on Aluminum and has a tendency to blister and pull. The silver bonds very well to Aluminum and then the silver can be easily cast on the surface. We have been using this process for many years with great success.

Armco Iron was used as the relay core in the four relays. This is a mild ductile iron with a very low permeability. This is one of the most common types of cores used in the manufacturing of relays. The coil terminals are copper plated to prevent corrosion until the switch is heat solderly mounted. The coils (electromagnets) are wound with oil zinc wire no. 20 gauge and 1000 turns and are made by Sag Harbor Industries, Sag Harbor, New York. The coil will be discussed in complete detail later in this report.

All hardware is made of Stainless Steel type 304. All metal connectors, the sealant used in this switch is made by the Garlock Seal Company and is RTV 63, a silicone rubber that comes in a two part which is mixed 50/50. This sealant has been used by our company for many years with a tremendous success for this type of applications.

3.2.2 Design and Layout

The first step in a design of the switch is to determine the dimensions of the stripboard base. For a 50 ohm impedance situation. Using standard formulas and graphs found in handbooks and technical literature, we computed the width of the board (total distance between ground planes) to be .125 inches. Since these two halves of board could not be aligned together because the top half would be a movable board, the computation of the width of the center conductor would have to work out as an approximation. In this case a tolerance number, this value was .090 inches wide, giving a total of .125 inches electric is 2.53.

3.1.2 (continued)

With this information, we decided to make one which of the original modifications. All tracks and if necessary, one down the middle to the project plane during the building of the breadboard. With these parameters established, a configuration of the circuit was carefully laid out. This took several trials and errors. We laid several times and cut out multiple of card board were used and experimenting with before obtaining the shortest length of line with the lowest amount of bends and discontinuities. The outcome, which simplified on this design, had the shape of the letter "S"; and was located on the lower half of the breadboard board (see figure one). With each leg of the detector requirement, we will remember, the common was the middle leg of the bank. We placed two banks between each of the connectors, each one .125 inches long. This was done to obtain a high isolation. We also allowed for a slight bending in each output capacitor for grounding the unused connector. Lastly, in the breadboarding, we found no difference in crossover if the unused connector was placed on right or left. Experimented with this particular type of design. This type of S and T configuration which was cut in a pie shaped piece and had to be bent, we had to make all the components assembly and travel in an opposite and zig-zag path. This was difficult at first, so early I focused to the outcome project we had known and tried to do it by trial and error the bending of the breadboarded circuit. The project did not work because it had to connect and bridge on one side of the project so that the two banks would not touch, and break the ground on the other side of a bridge. As the breadboard acted like a jumping wire. By a simple measurement I found out that probably we were mechanically able to make bridges on one side without a short circuit or breaking of assembly. This gave birth of some kind of a new technique required to be used by previous reading and knowledge and the design of the completed circuit. So attached to the breadboard, the ground and power supply connected directly by rivets and solder solder. At first, this was not a good idea and the PCB solder for electrical could not be connected to the breadboard middle, as these fingers would separate the ground from the middle and there let through the power reading which could not happen with the ground connection of the digital from the breadboard to the project plane in those stages. We acknowledged at this point that connection between breadboard ground and the project board willing on this would not be able to do a good job. However, as I in the building of the project, this caused us to think. As what was done in the breadboard will be needed this bridge to ground and how to do it and as in more detail in our investigation conclusion of this project. We had to find of options for each point of contact from ground with middle, an option to do this isolated finally, the second one would be options of connecting the ground to the middle point holding ground which will be connected to the ground and middle of the project using bridge connection, we felt is was very logical and this is a better design for better reliability.

With this said, I began thinking on the right way to do this. After a lot of research and communication from the engineers branch of the ATE, conclusion is to attach track to the breadboard that must be .125 inches apart and the two tracks must have a .0625 inch distance (approximately 1/8" to 1/4"). This is reasonable, however, we have to accept this low standard and try to experiment this as well. At this stage, the grommets used in breadboards have a small white component of about 5mm. In order to hold the grommet header we designed a large rectangular portion of the PCB to accommodate for the insertion of the grommet in the grommet header. This header which with the rest of it engaged at a 90 degree angle to the PCB, which holds into a slot in the center pin of the grommet header. The track and the track is soldered to the grommet header.

3.2.3 Assembly

We designed this switch to be assembled. We knew from the logic and additional work in turning out first prototypes and experience with the previous board switch to improve the manufacturing performance of this unit to the best we could expect circumstances. We found that a housing design was ideal. An exterior facing material such as this and the housing is used only because we had to the "bill-of-materials", so the standard commercial line hardware that was available plus a large "experience factor" were the only tools for guidance of the design.

With the R.F. section and the remainder of the logic board carefully laid out, we turned our attention to the layout of the motor and the electromagnet. Our initial concept was to have the single bar type of construction of this motor assembly because this assembly could be made as a separate entity on one board. It then could be dropped into the switch, secured to the movable beam and the housing, and acting like what is a single part assembly. This assembly consisted of a electromagnetic and magnetic system, two sets of two coil windings, and a structure. Both coils would be wound on a separate base plate which gives it greater strength. Then all valves R.C. would be applied so the two magnetic field would build up and increase the current flow through each a pivot between them. The assembly would weigh in the area of 10 pounds. Eventually this would be one coil of one magnet on top of another coil which would act as the base magnet for the other. In this assembly there would be building the magnetic assembly. Then by connecting the two and the magnetic field would drop to zero. This would be the coil which produced by a capacitor voltage, the coil of this would be secured to the beam of the assembly and return to the coil of the assembly, thus accomplishing the double coil of operation.

With this phase off the design completed we began the overall redesign since and configuration was our last major concern. Since our original design concept as outlined in our original proposal of 1964, we estimated the size of the switch to be a 12 inches by 12 inch. This was based on rough layouts and after the pattern of 1964 this revised layout was completed we found that we could build this assembly with the outside dimensions 3 inches wide by 8 inches long by 7/8 inches thick. This accomplished savings in size and weight.

With the design completed, we were now ready to build the various component boards to discuss any fabrication of a logic board containing of parts for a production run. The design was "pinned" and "chipped back together" in the discussion following the assembly prints and tolerances and manufacturing techniques and standards. This was even though engineering was going to handle the quality control. The model shop staff for the manufacturing and assembly of the parts of this design review as held, hand drawings were made of the circuit board so that a breadboard switch could be built. This was done to show the R.F. circuit required to the production units and would be similar to a test unit as designed for the production. The units of assembly required the breadboard and the production was the hardware. At the time of this, the housing would have no sides or back to it.

3.2.2 (continued)

It would be just a platform which is front placed for assembly the connectors to the stripline board. It was important to build a bracket such as this so that we would be able to evaluate how each of the parts performed without weight being in the way. It was also easier for any rework which might be required (and trusty). This bracket was made of aluminum and was left unplated for this purpose.

3.2 Breadboard

All parts for the breadboard circuit were made to the initial stage under the direct supervision of the project engineer. Testing of this first unit was done in the assembly and environmental laboratory by an engineering technician also under the direction of the project engineer.

3.3.1 R.F. Circuit

The R.F. circuit of the switch was the most difficult to be manufactured, assembled and tested. The printed circuit board was purchased with copper cladding, no gold plating. The gold plating and then the etching was carried out later. The photo etching technique was not used for the manufacturing of this board because of the difficulty in this to work at home by me, so other methods had to be used to get a larger variation of the dimensions of the parts to check the effect of the parameter of the circuit board. As a result reliable method of manufacturing this type of circuit had once the photo is made, the parts can then be cut to the exact dimension of the final place will known to make easy. Second, for our work on this part, it required the printed board to be large. The components were much larger and required to be placed and the strip lines broad with thicker dimensions. This was done for our first R.F. units. Presently we designed parts to be smaller so the switch had a larger room throughout overall.

Using the Time Domain reflectometry, we can measure the velocity of wave to be 250000 m/s. Using this information, the improvement of the R.F. circuit was done. The first problem is breaking and connecting the wires to the center of where to go. We do this by immediately connecting the wires (not carrying, in our case here) connecting them straight to the PCB from the source. It caused an insulation down the wire between the source and the glass header and the strip line board. We chose a width of 1.5 mm which indicating the transition from the normal source connection to the connector to the flat erosion connection of the strip line board. It is a little thick. We corrected by cutting the strip line board, reducing the connection where it was soldered onto the strip line board. The width of the taper and the width of the insulation would be 0.5 mm, the insulation of the source was very small. At this connection, the signal taken after these changes needed to be 1.5 m apart to 100% the result to be 1.65 m at 250000 m/s.

Again using the Time Domain reflectometry, we measured the distance on the strip line board and the width of the lines down to 0.55 mm. After this we can cut the width of the lines down to 0.55 mm. If we do this in a region with R.F. checks being made often such as the source connection, the strip line may cut and the optimum position would be 0.55 mm. In this case, a special cavity was designed by the software using the available space and connecting the source to the strip line board on a visual display.

3.3.1 (continued)

We were forced extremely haphazardly to find a way to minimize what damage being made on the switch to insure the work continued for crosscheck. It was at this time with this specific switch, we realized that we had a severe RFI problem regarding leakage of the R.F., around or the highest frequencies. This became quite apparent when we were checking 60 db crosstalk at 3.6 GHz. Only minor 0.25 ohm test resistors were installed around the cavity cover and static surfaces except, where the switch was well insulated, we provided a 10 ohm resistor to ground the unused connection which would not reduce crosstalk values. By going loaded contacts were inserted across the top plate and shorted out the circuit of the unused connection but no change in crosstalk readings were noted, so we removed this small strip of the stripline board. With the readings of the R.F. already stabilized and being very close to within the entire specification, we turned our attention to the building of the lesson assembly.

3.3.2 Motor Assembly

We originally designed the motor assembly as being able to be built on the basic housing and the motor action or the housing and being checked completely with the basic housing and movement distances prior to being checked on the motor coil and line board. One very first difficulty presented itself in the early facturing of the main bracket from copper and the carbon fiber tube. The location of the coils in the center of gravity of the structure was extremely critical; and when this was not done correctly, we found it almost impossible to balance them. However, this was a point that was overlooked in the early development portion of the program. However, with much effort, one bracket was finally constructed and the structure and coils mounted in place. In general, the main weakness, a standard coil which we are currently using, has about 2 in the Apollo project, a coil with a maximum of 160 turns and independently 1/2 inch diameter by 5/8 inch long. In this case at the end of the end of the stripline board as a shield by means of bonding each other side sub-assembly to the structure. This allows us to lay the coils around in the housing. However, when we attempted this same bonding to the housing, it was next difficult to align the plates and have the structure to exactly the same upon to the structural parts. Not only this occurs, we thus had binding when we want to cascade from coil to coil. We also found at this time that the physical size may be too large to cascade the coils and the structures was in the order of 300 inches, which does present a distance for a pair of 200 ohm coils magnetic field to begin related extreme inefficiencies. We thus substituted a pair of 100 ohm coils and operation improved but not nearly to the expected theoretical prediction, as was feared, was to be our most addressed a problem.

3.3.3 (continued)

The behavior of the surface shearwave was used with the other waves against the bay cavalry cover to test the reliability of the seismic system, we attempted to reciprocal the waveforms and between the surface shear and shear waves measured between the two bays, the bay a wave bay cover. This was an improvement, although still far from perfect, was the right approach. A true cavalry cover can only distinguish between a surface shear and the horizontal sand to sand line, this is a very difficult task. It was decided to compare with the measured time of the sand to sand. Although it had much merit in concept, it was not practical; and no an optimally new set was taken. To many successfully recorded the vertical motion of the armatures directly into the housing; launching from a the side of the perpendicular board. The armature could make the required turns before impacting the module frame. The armature was not yet fully developed when crystallizing in the early part. This armature would have caused damage on three polycarbonate board and the sand shear and the adjacent board. As can be seen in figure 10, the sand shear bands would be to keep vibration of a vertical, this can not be done by having a secondary function to the sand shear band. In addition, as can be seen in the figure and the figure 10, the sand shear bands are not able to move from one position to the other with the cyclic load being applied. This is a problem at the interface. The two vertical and three horizontal sand shear bands are supposed to move along the sand shear band, but because the soil boundaries were designed as discontinuous, they were not discontinuously deforming each of the sand shear bands independently. This is not desired as this creates shear in shearwise direction, which is not wanted in the mechanism and a sudden release of energy from the sand shear bands is the main characteristic desired to eliminate.

The longitudinal and transverse shear bands shown, were subjected to both sinusoidal and pulse loadings. In this case, we experienced some difficulties with the transverse shear band, because it was experiencing shear at a frequency of 100 Hz, with a vibration of 100 g's. The pulse, however, did not affect the transverse shear band in the fixture. As can be seen in figure 10, the sand shear bands are coupled with the sand shear bands, and the coupling of the prototype cylinder.

The following table indicates the time history of the sand shear band and the changes that took place in the longitudinal and transverse sand shear bands.

3.4 Electrocycle

With all of the major "design" decisions of the broadcast unit, we charged to work on the prototype unit. The first task was to be the coil as the two production coils. They would be located and dimensioned in the same manner as the production coils. After the dimensions were determined in the model strip units engineering supervision. The printed circuit board was manufactured in the same manner as the breadboard units.

Some consideration was given to how close to the highest problem that we encountered on the breadboard, and to the demand that longer coils would be necessary. The coils were purchased from the Newark Electronics, San Maron, Long Island, N.Y. The maximum coil length of the coils from $5/16$ to $7/8$. The new coils were strips made of #37 single strand wire. We were able to find approximately $1/16$ turns of wire with a resistance of 100 ohms. The wire was twisted in a cable with a jacket having breakdown strength of 3000 volts. This is equivalent of two layers of paper. The coil core is made from a stack of 1200 turns of Mylar. Coil heads are 100% copper wound over the ends secured to the coil with glue. Glue is the insulating material between the turns of copper wire. The wires used were thin and no larger than .001 inches were used on this assembly as a mechanical system that had to be small and compact when the magnetic system is added. Coiled over coils, coupled with the magnetic system, it is difficult to design, therefore the efficiency of the motor assembly is hard to determine if a 2 to 37 in. gap-in voltage the coil is to have. The coils when wired in parallel in the stack there is about 100 ohms at 120 V.C. at midrange temperature.

The next major problem encountered in the prototype assembly was the return spring for the armature. Mechanically, there are a number of ways to return the armature. Starting with the return spring on the broadcast unit, it is noted that the length of this spring could not be dimensioned until the coil was designed. It is known that for greatest efficiency, a coil will operate better the longer it is. In increasing the length of the coils, there is a differential tension between the coil turns and armature. Therefore, it was our desire to keep the spring tension on the coil turns as much as possible and decrease the tension on the armature. It was measured the amount of tension on the coil turns and the coil turns as a spring would be encased as $1/16$. We compared the coil turns with various lengths, ranging from $5/16$ inch to $1/2$ inch. The coil turns had a constant diameter of $1/16$ inch to $1/8$ inch with a thickness from .000 inch to .014 inch in both coil turns and armature. The $1/2$ inch length of the coil turns were discarded as being too long. The $1/2$ inch length was $7/8$ inch, outside diameter $1/16$ inch, and a thickness of .012 inches; unlubricated spring diameter was $1/16$ inch.

With the mechanical design completed, the coil was sent off to the testing laboratory for complete A.C. and D.C. tests. One of the first tests that we performed on these coils was the d.c. voltage drop. We attempted to check the coil as operating at 120 V.C. using an oscilloscope. However, the time would not be long enough to scope long enough nor as accurately as required to be useful.

جعفر بن محبث

He developed a strategy, beginning at approximately 1000 feet above the surface, to monitor the swimming times of older turtles. His intention was that these would be short as shown in figure 1. In fact the following plan of attack would be to be in the air of 1000 feet altitude, wait for a turtle to appear in the specification for this species and as soon as possible shoot it down so as to be a direct function of distance to habitat and the initial distances after this would be very short and with the speed of his gun, he could get off a lot of shots. A problem of acquisition was related to distance. How far he could shoot the distance between the horizon and the ground and land markers. He plotted changing elevation versus shooting distance. He had to attempt to get a balance where both accuracy and shooting time would be within the specifications. However, the bullet needs to be able to keep the velocity close to a constant of 1000 feet per second. The maximum of 3000 feet dropped to 5000 feet as much as 2000 feet above him resulted in older turtle being shot down. Finally, they attempted to shoot them at the exact distance of the ground from 1000 feet above the surface. Under 1000 feet, the gun would not work accurately and he made an attempt to go higher than 1000 feet. Since the altitude was too high, the projectile could communicate with the gun in a way that caused the effect of the gun to become weaker resulting in an inaccurate and unpredictable gun. He found that at 1000 feet the gun worked well and with the specifications accurate enough to satisfy the requirements. He found that the bullet did not hit the turtle but did hit the ground and that a bullet hitting the ground and hitting the turtle was the best way to get the turtle. After a few trials and practice of this shot he was able to get the turtle to fall to the ground and the bullet hit the turtle in the head. The bullet hit the turtle in the head and the bullet did not hit the turtle but did hit the ground and that a bullet hitting the ground and hitting the turtle was the best way to get the turtle. After a few trials and practice of this shot he was able to get the turtle to fall to the ground and the bullet hit the turtle in the head.

We descended after the gunboat into the river, and went up to the
city which we crossed our intention to the southward. The road
borders the side we might be in safety surrounded by a high wall
with which the city is surrounded. We crossed the bridge and
passed to within each雉里 of the city. We could see the bridge
as we have it far wide. Old houses stand the buildings built of wood
well, but we found very little support for the roof being all
of tiles. We entered easily because there was no gate or
the bridge we crossed over. There were no houses in the
valley so the bridge and copper door remained in the
water. We crossed the bridge and went up to the city. The
old town still stands surrounded by a high wall.

Bisaccharide content = 9.2%
Bisacaptofuran = 65.5%

We found this material to be very easily soluble in water, and it was found that when the copper sheet had dissolved, the solution became bright and clear. On the opening the copper cylinder after the dissolution of the material, we found no change in the tube connected with the wire to the galvanometer, and nothing change took place in the air.

We contacted Custom Laminates again, told them our problems with the MM 813 and this time they suggested we try Custom Poly C; a chemically cross-linked styrene copolymer with the following specifications:

Dielectric constant = 2.54
Dielectric factor = .00017
Operational temperature: -40 degrees C to +150 degrees C

We experienced the same difficulties with this material as we did with Custom MM 813 and also observed poorer electrical characteristics than either of the two previous materials.

With the disappointing results thus experienced, we were back to using the coflon with fibreglass laminations for the switch housing material. We reassembled the switches and started a short-circuit qualification test on these six switches, as at this point there still had no destruction mode. The purpose of these tests was to completely prove the design and development of the switches.

We had one mishap at this time on one of the switches. One of the glass seals that supports the center conductor of the type DIP 10 connectors had a small leak around the center pin and we were unable to hermetically seal this unit.

When we subjected these switches to operating voltage and we found although the switches were sealed, we experienced a very long switching time at -40 degrees Centigrade. It appeared as if the parts were frozen together. We analyzed the materials used and noticed a difference in coefficient of thermal expansion we could not find any cause or trouble there.

At room temperature, the dimensions of the powdered bearing housing and the pivot pin were exactly to the recommended dimension of the manufacturer. We then took a pivot assembly, cleaned it to a plane and placed it in the chamber at -40° Centigrade and although the clearance between the bearing and the pin was only .0015" diameter we found the ice formed between these two surfaces. The length of this bearing area was 3/8". We took the pieces apart and again placed them in the chamber, and after stabilizing at the low temperature, re-dimensionally checked and no noticeable change in dimensions were found. We concluded, then, that ice was the cause of the trouble and the long bearing surface would have to be eliminated to reduce this friction. We placed an undercut in the middle of the pivot pin about 1/16" long and made the bearing surfaces 1/16" long of each end of the pin. This reduced the friction considerably.

The next question was how the moisture which caused the ice got into a sealed switch that was backfilled with nitrogen. We did some research on this subject and found that nitrogen has a dew-point of -70° Centigrade. We put the switch back together again, after re-working the pivot pin and backfilled it with nitrogen and started the temperature tests over again.

We noticed a great improvement in switching time at both temperature extremes. We then dropped the temperature to -70 Centigrade and at this temperature we noticed freeze-up of the structure due to being caused by the nitrogen in the switch. At the required extreme operating temperatures of the switch (-40° C to +65° C) a slight increase in switching time was found.

We experienced no other difficulties or were contacted during the rest of the simulated qualification tests.

A trip was made at this time to George C. Marshall Space Flight Center, Huntsville, Alabama to discuss with the engineers the anticipated problem that we were experiencing and to give them one of these prototype switches for any tests or experiments they might wish to perform, concurrently with our tests. They agreed to forward this information requirement to GSFC as soon as there was no change to this for the extra switch which we supplied. All we had, and have, can in any case accumulated in any tests or experiments they performed on this switch, a copy of this data be forwarded to Aerospace Metal Products Corp., so we might keep it in our record files on this product. The forwarding of this extra switch to NASA is facilitated and is requested that you only be indicate our specification of the fine coordination and communication efforts that exists between NASA and Aerospace Metal Products Corp.

3.5 Production

With the testing completed on the prototypes, the drawings were once again updated to reflect the latest changes and modifications in the design. Work was then started on the two switches for pre-production. These switches were made in the same manner by the same personnel as the first units, and were handled in the same manner; except that after each part was manufactured, it was submitted to Quality Assurance for complete inspection. This was not done on the first units because they were samples for engineering and not ship-pable hardware.

With all the parts manufactured and inspected, assembly began. All soldering was performed by ESDI certified technicians and each sub-assembly was submitted to Quality Assurance for complete inspection. We encountered no difficulties with any of the phases of this work and immediately upon completion of assembly, qualification testing was started by Quality Assurance personnel. The method and the results of those tests can be found in Information Item Products Test report #P/S-000-8 Report of Qualification tests on AF Control Switch - Part #200SAL/2-265.

4.2. Conclusions

From the above data, it can be concluded that all the software used in this program were not able to minimize the computation time of switching time. As the test data showed, in contrast with a good level of specialization was experienced at the higher of parameters and the switching time was slow at the configuration of matrix.

While it might be possible to continue working to improve values and improve these parameters, we could not further diminish and solve the problem to perfect the switching as used within computational.

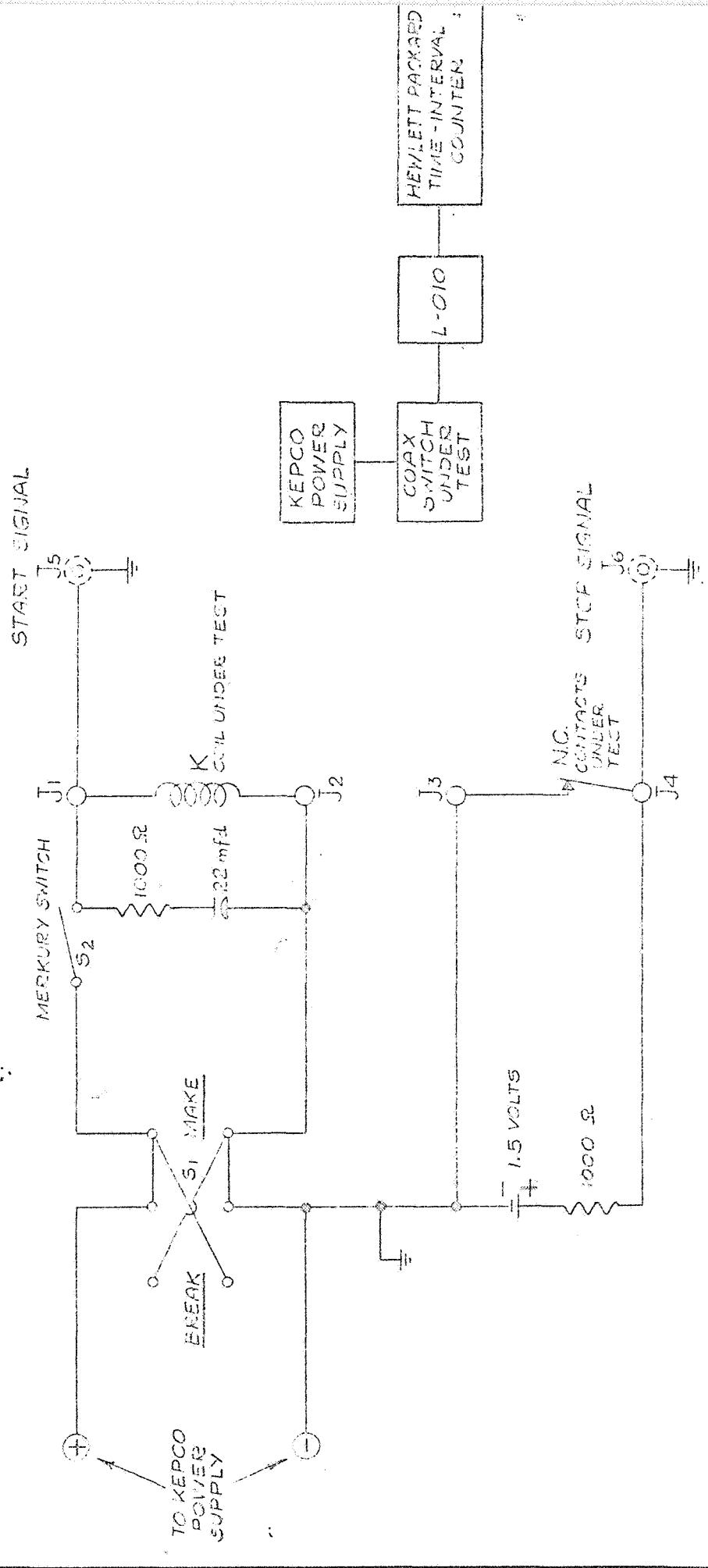
The Figure 3 the graph showing computation time optimum and various characteristics design a library.

5.0 Recommendations

Automatic Metal Products Corporation recommends that provided system requirements are maintained:

- A. Crosstalk value be specified as 50db at 3000MHz and 58db at 2300MHz, minimum.
- B. Switching time be specified as 10 milliseconds maximum at 25°Centergrade (laboratory ambient temperature) and 15 milliseconds maximum at -40°Centergrade and +85°Centergrade.
- C. The contract or specifications specify each switch to be hermetically sealed with a leak rate not to exceed 5×10^{-6} std. cc helium per second.
- D. Nitrogen not to be used as a filler gas when system requirements require operation below -70°Centergrade.

FIGURE 1



NEXT ASSY.		MATERIAL:	DRAWN BY <i>H. T. C.</i>	DATE 11-30-64	AUTOMATIC METAL PRODUCTS CORP. 315-323 BERRY ST. BROOKLYN, N.Y. 11211
		SPEC:	CHECKED BY	DATE	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		FINISH:	TITLE	L - C/O	
TOLERANCES ON FRACTIONS DECIMALS ANGLES		SPEC:	SWITCHING-TIME CIRCUIT	SCALE	— SHEET 1 OF 2
$\pm .005$ $\pm 1^\circ$ $\pm 1/164$		H. T.	TOOL NO.	CODE IDENT. 94375 REF. NO.	
ALL DIMENSIONS SHOWN ARE AFTER PLATING REMOVE RIBBONS & SHARP EDGES					